Libby Asbestos Superfund Site
Operable Unit 3 (OU3)
Ecological Risk Assessment

Briefing for Carol Campbell, Acting Deputy Regional Administrator
January 7, 2010

Purpose: Briefing is informational only. Focus is the ecological risk assessment for Libby OU3.

Proposed Agenda

1. OU3 Basic Information

   a. Remedial Investigation/Feasibility Study (RI/FS) performed by Responsible Party W. R. Grace
      - Administrative Order on Consent (AOC) signed September 17, 2007
      - Roles of EPA, State and W.R. Grace

   b. Definition of OU3

      - *"...property in and around the Zonolite Mine owned by W.R. Grace or Grace-owned subsidiaries (excluding OU2) and any area impacted by the release and subsequent migration of hazardous substances and/or pollutants or contaminants from such property.."* (from AOC)
      - OU3 includes mine property, Kootenai National Forest surrounding the former mine, Rainy Creek and it tributaries that drain the mined area (Carney and Fleetwood Creeks and several ponds), and the Kootenai River
      - Preliminary study area boundaries have been set

   c. Scope of RI/FS

      - Nature and extent of asbestos and non-asbestos contamination
      - Includes both human health and ecological risk assessments
      - Includes investigation of
        - Ambient air
        - Soil
        - Tree bark
        - Forest duff
        - Mine waste
        - Sediment
        - Surface water
        - Groundwater
        - Biota
      - Includes assessment of human recreational use, commercial logging, and Forest Service activities (e.g., fire fighting)

d. Schedule

- Remedial Investigation complete – January 2012
- Risk Assessments complete – February 2012
- Feasibility Study complete – December 2012
- Record of Decision – July 2013

2. Community Engagement

- Initial 2-day meeting with stakeholders in Libby in 2007
- Public meeting held in 2008 to present sampling results
- Frequent communication with Forest Service, Fish and Wildlife Service, and Plum Creek Timber
- Updates to TAG by conference call
- More outreach planned during development of sampling plans and as more results become available

3. Role of the Ecological Risk Assessment

- Risk management goal: Reduce risks to levels that will result in the recovery and maintenance of healthy local populations and communities of biota
- Evaluating effects on
  - Survival
  - Reproduction
  - Growth
- Ecological risks may drive remedy decision on OU3

4. Ecological Risk Assessment Details

- Ecological Risk Assessment Process
- Weight of Evidence Approach
- Application at Libby OU3

January 7, 2010
Briefing for Carol Campbell

List of attendees:

Carol Campbell
Bonnie Lavelle
Dan Wall
Mary Goldade
Victor Ketellapper
Russ LeClerc
Bill Murray
Martin Hestmark
Andy Lensink
Liz Evans
Libby Faulk
Ted Linnert
David Berry

Libby Asbestos Site

Operable Unit 3

January 7, 2010

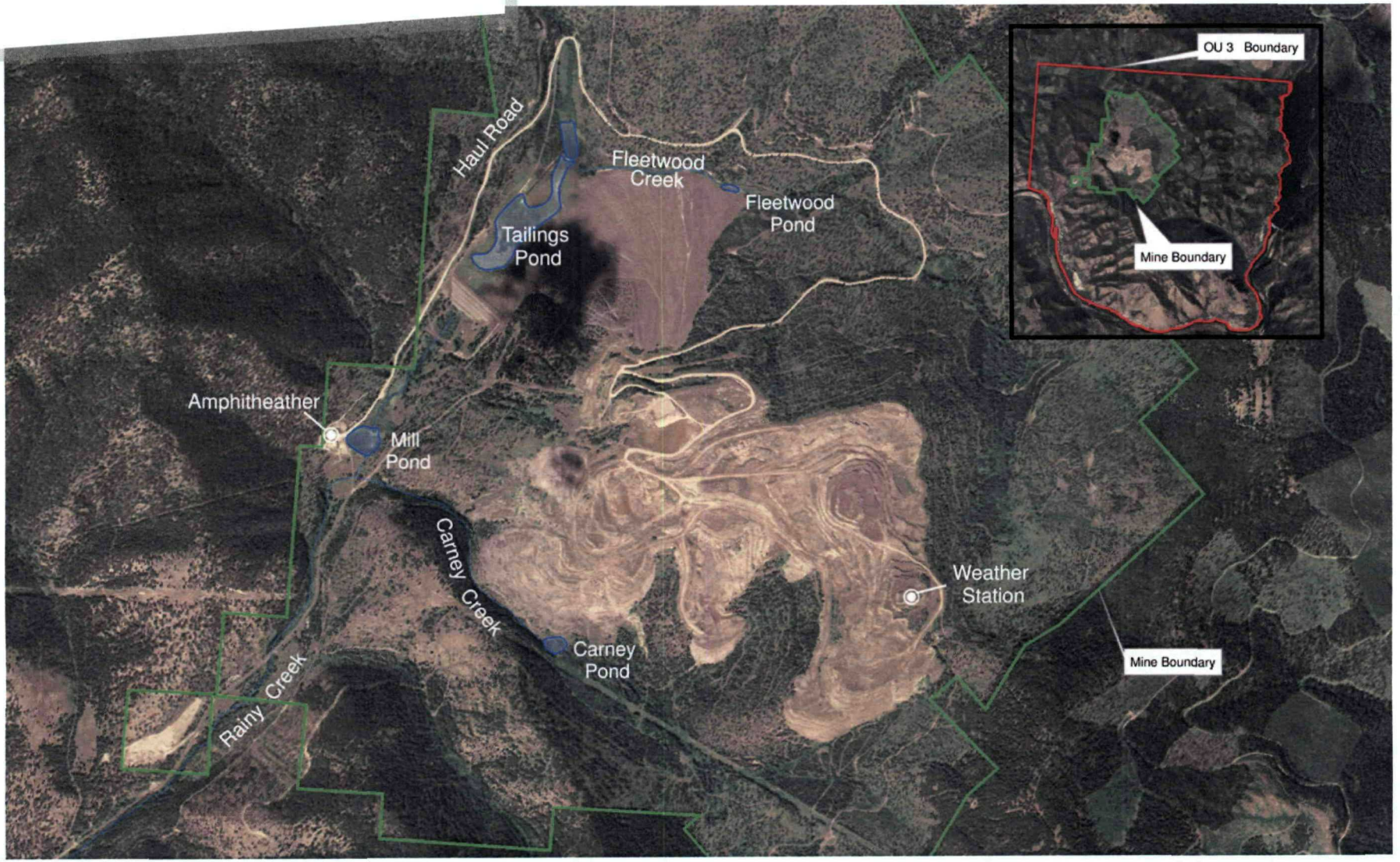
Roles of EPA, MDEQ and W. R. Grace

- ***EPA and MDEQ develop sampling plans***
- ***EPA implements laboratory QA program***
- ***EPA performs risk assessments***
- ***EPA and MDEQ develop RAOs***
- ***EPA selects remedial action***

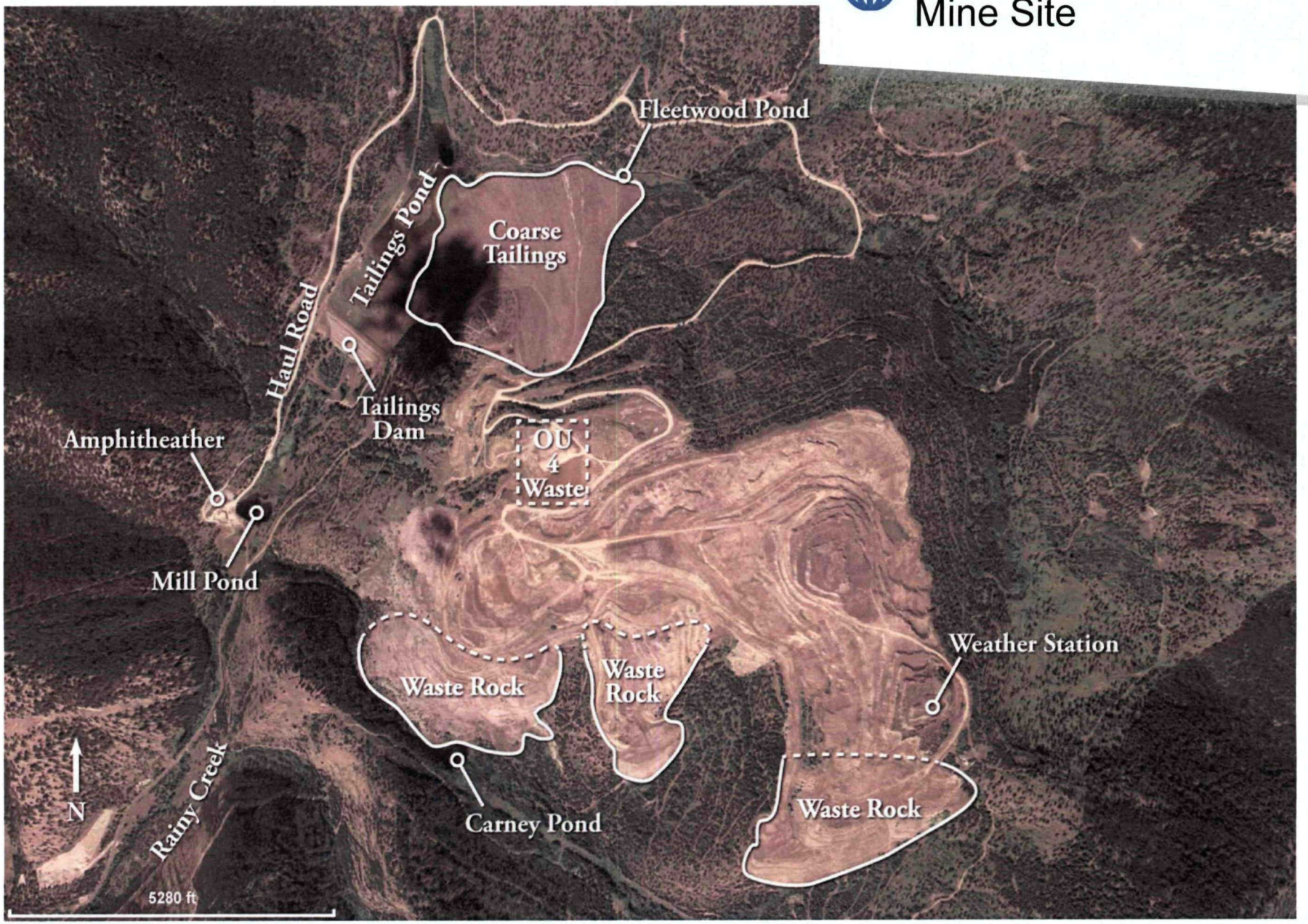
- ***W.R. Grace implements sampling plans***
- ***W.R. Grace pays for lab analysis***
- ***W.R. Grace prepares field summary reports and RI report for approval***
- ***W.R. Grace prepares FS report for approval***

Regional View

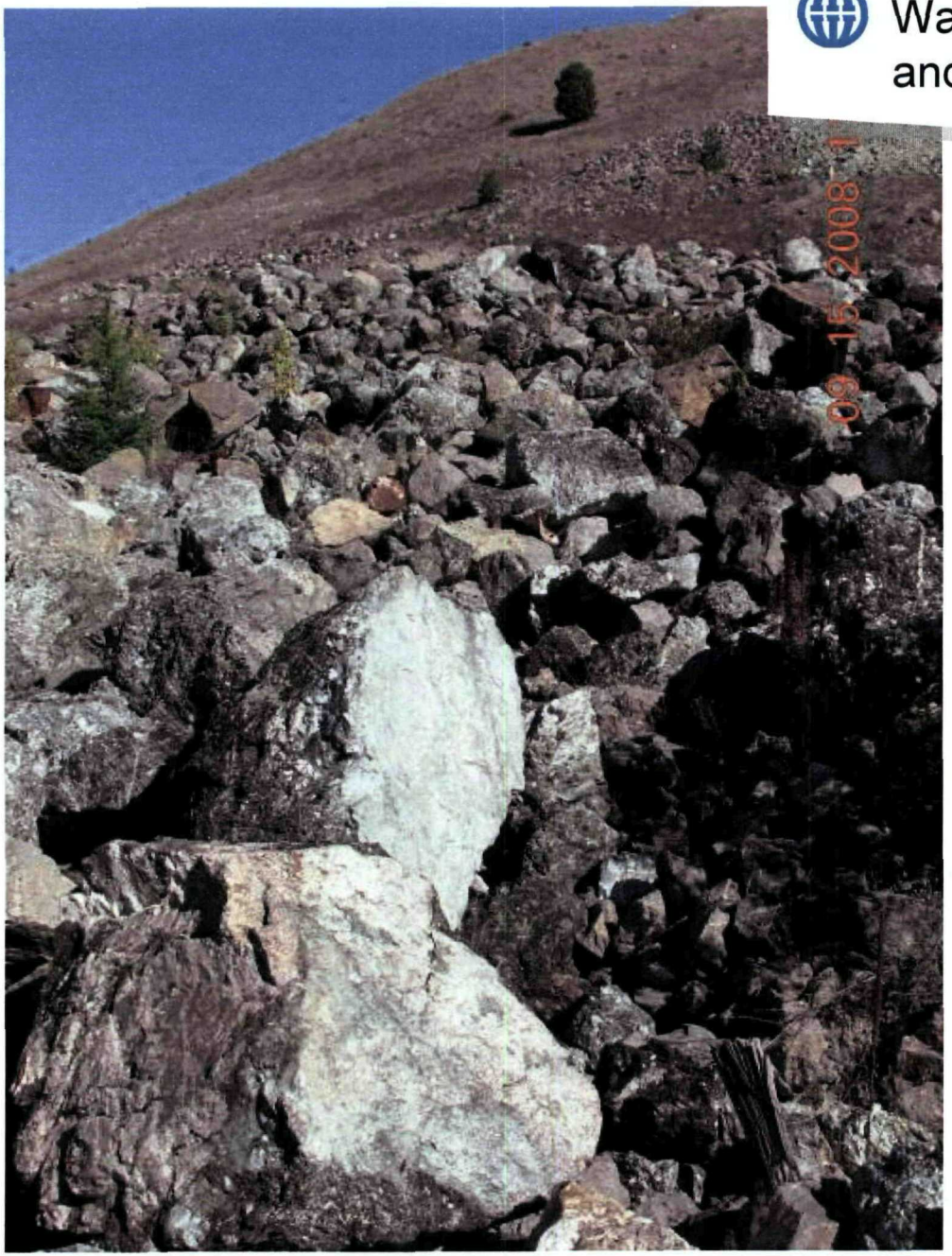
Water Features



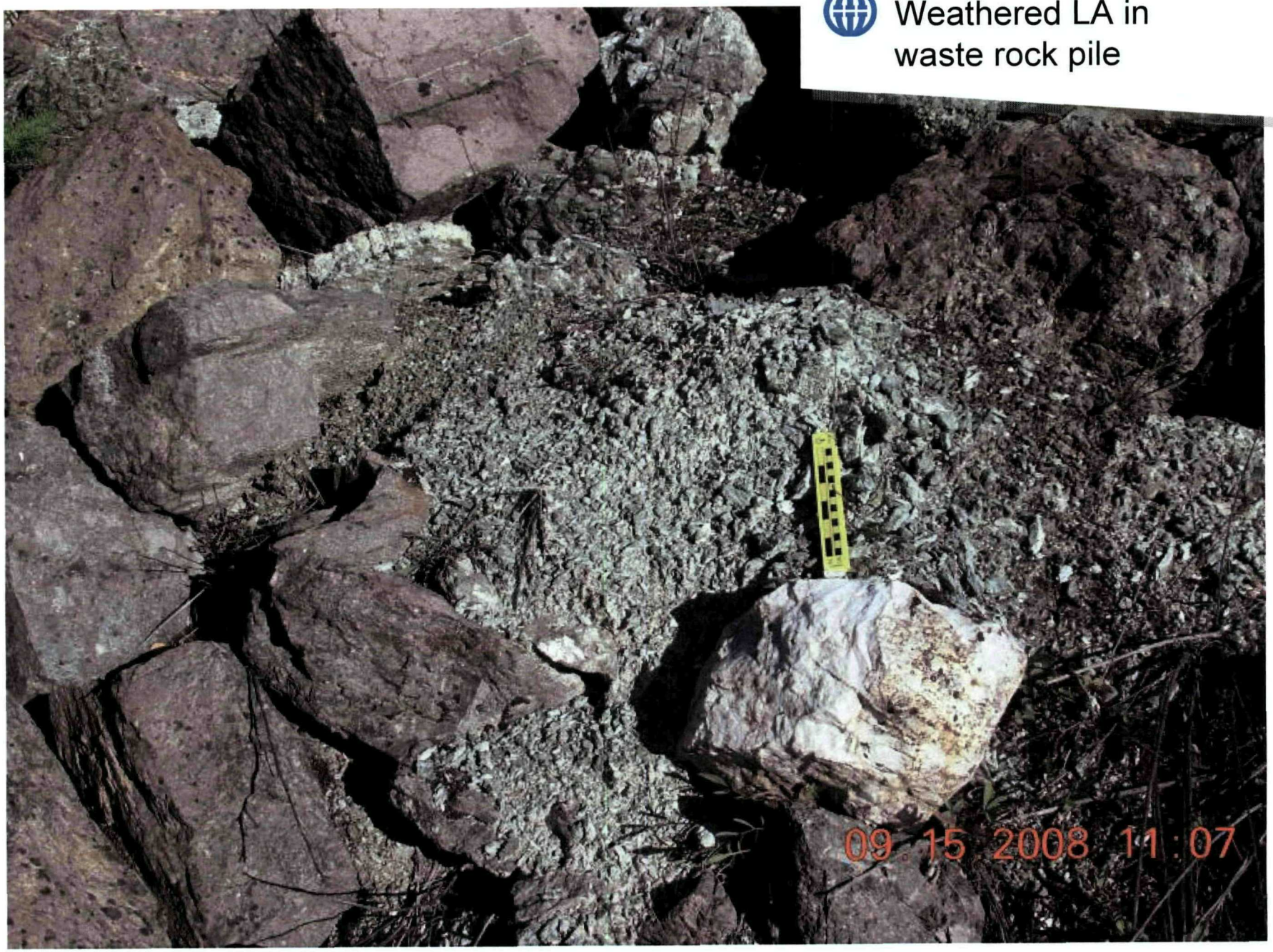
Mine Site


Fleetwood Pond
Coarse Tailings
Tailings Pond
Haul Road
Tailings Dam
Amphitheather
OU 4 Waste
Mill Pond
Waste Rock
Waste Rock
Weather Station
N
Rainy Creek
Carney Pond
Waste Rock
5280 ft

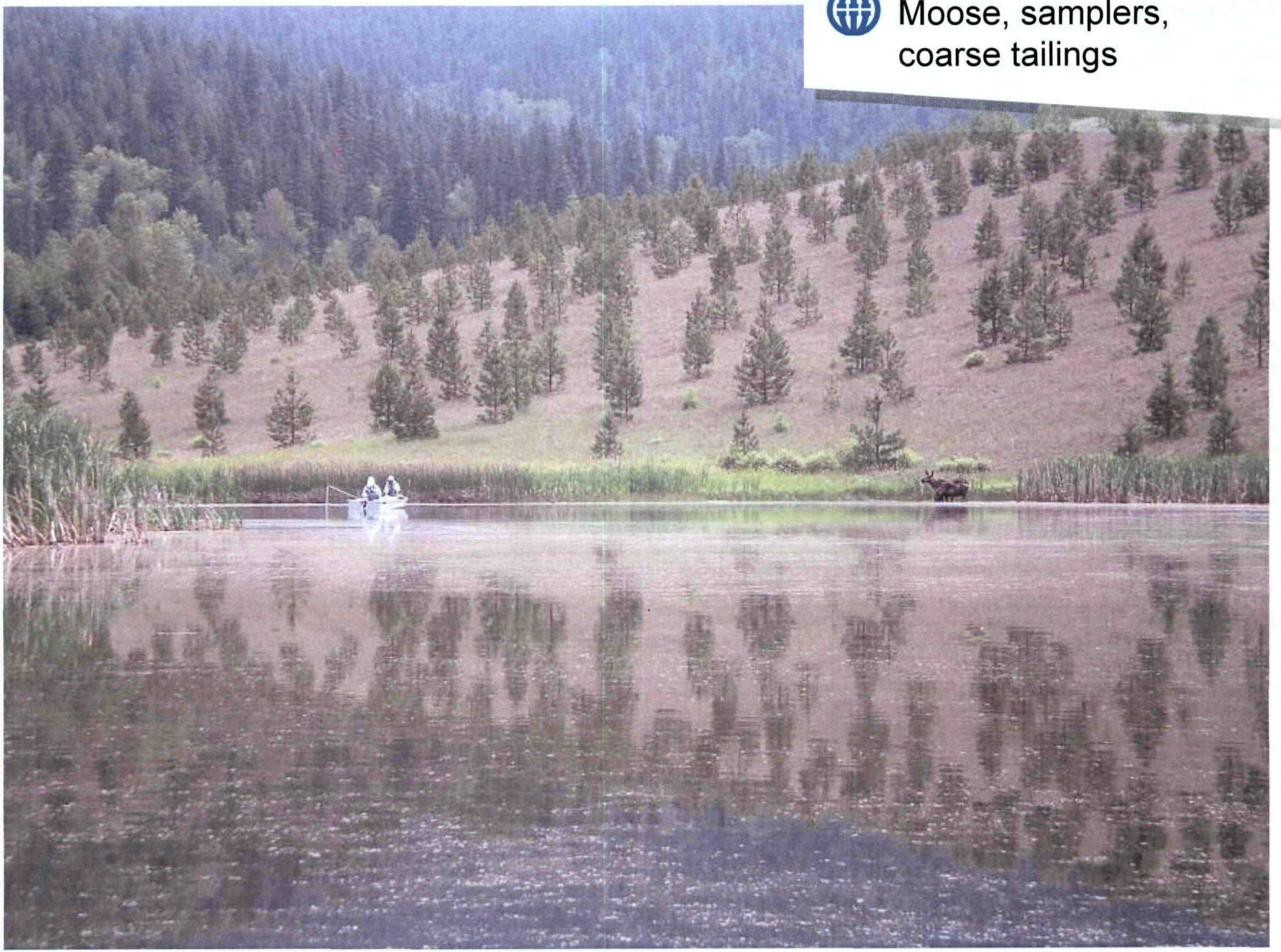
Waste rock pile and slope



Weathered LA in waste rock pile

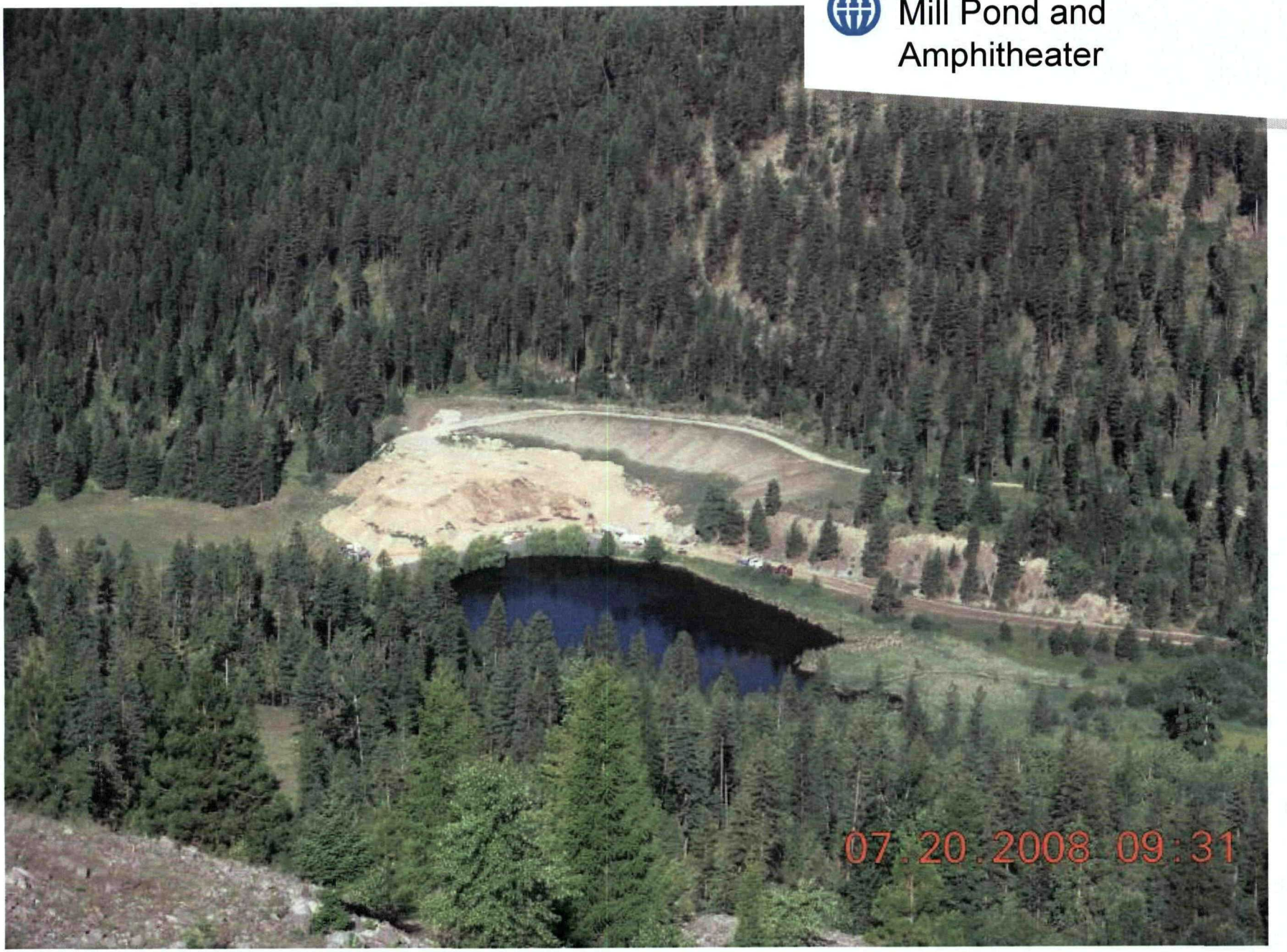


Moose, samplers, coarse tailings



Oversteep west side of coarse tailings pile

Mill Pond and
Amphitheater

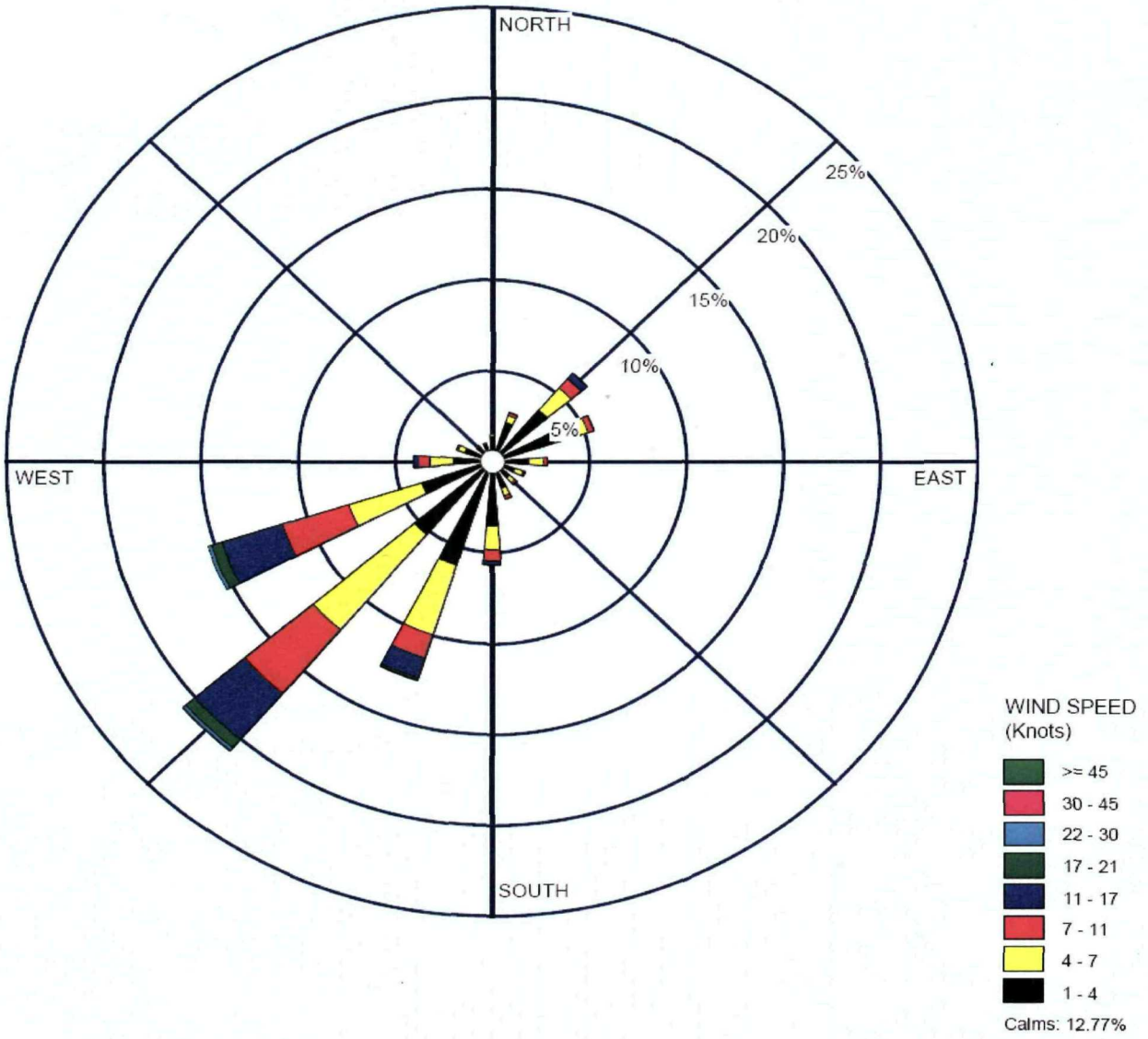


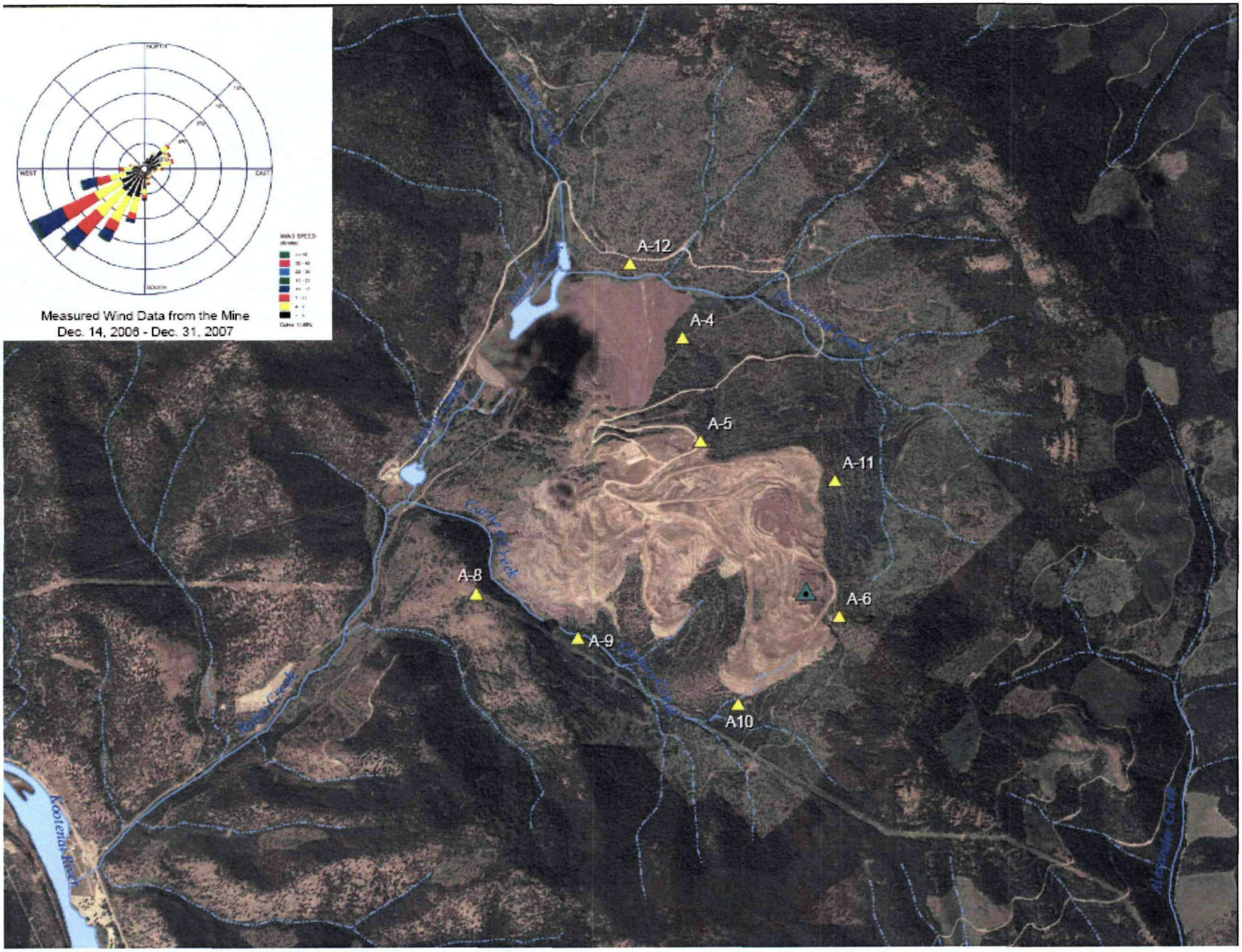
WIND ROSE PLOT:

Zonolite Mountain
Libby, Montana

DISPLAY:

Wind Speed
Direction (blowing from)




NORTH
WEST
EAST
SOUTH
WIND SPEED
Measured Wind Data from the Mine
Dec. 14, 2006 - Dec. 31, 2007
A-12
A-4
A-5
A-11
A-8
A-6
A-9
A10
Kootenai River


SL15-16
SL15-15
SL15-14
SL15-13
SL15-12
SL15-11
SL15-10
SL15-09
SL15-08
SL15-07
SL15-06
SL15-05
SL15-04
SL15-03
SL15-02
SL15-01
SL45-16
SL45-15
SL45-14
SL45-13
SL45-12
SL45-11
SL45-10
SL45-09
SL45-08
SL45-07
SL45-06
SL45-05
SL45-04
SL45-03
SL45-02
SL45-01
SL315-08
SL315-07
SL315-06
SL315-05
SL315-04
SL315-03
SL315-02
SL315-01
SL75-16
SL75-15
SL75-14
SL75-13
SL75-08
SL75-07
SL75-06
SL75-05
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SL75-02
SL255-04
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SL195-02
SL195-03
SL195-04
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SL195-06
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SL195-08
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SL195-11
SL195-12
12W
12S
376A
376B
21.0
241
500


MS-1
MS-2
MS-3
MS-4
MS-5
MS-6
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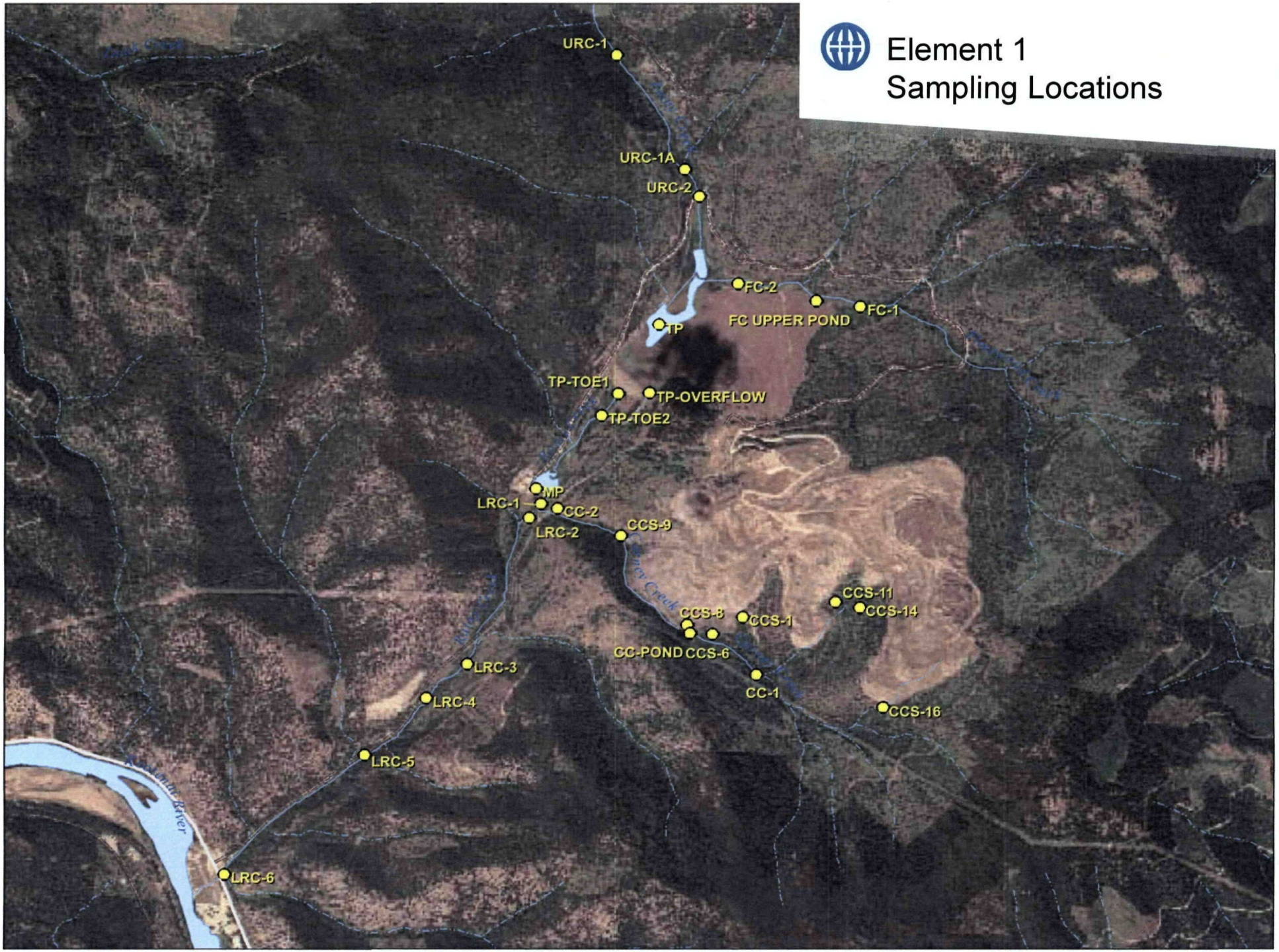
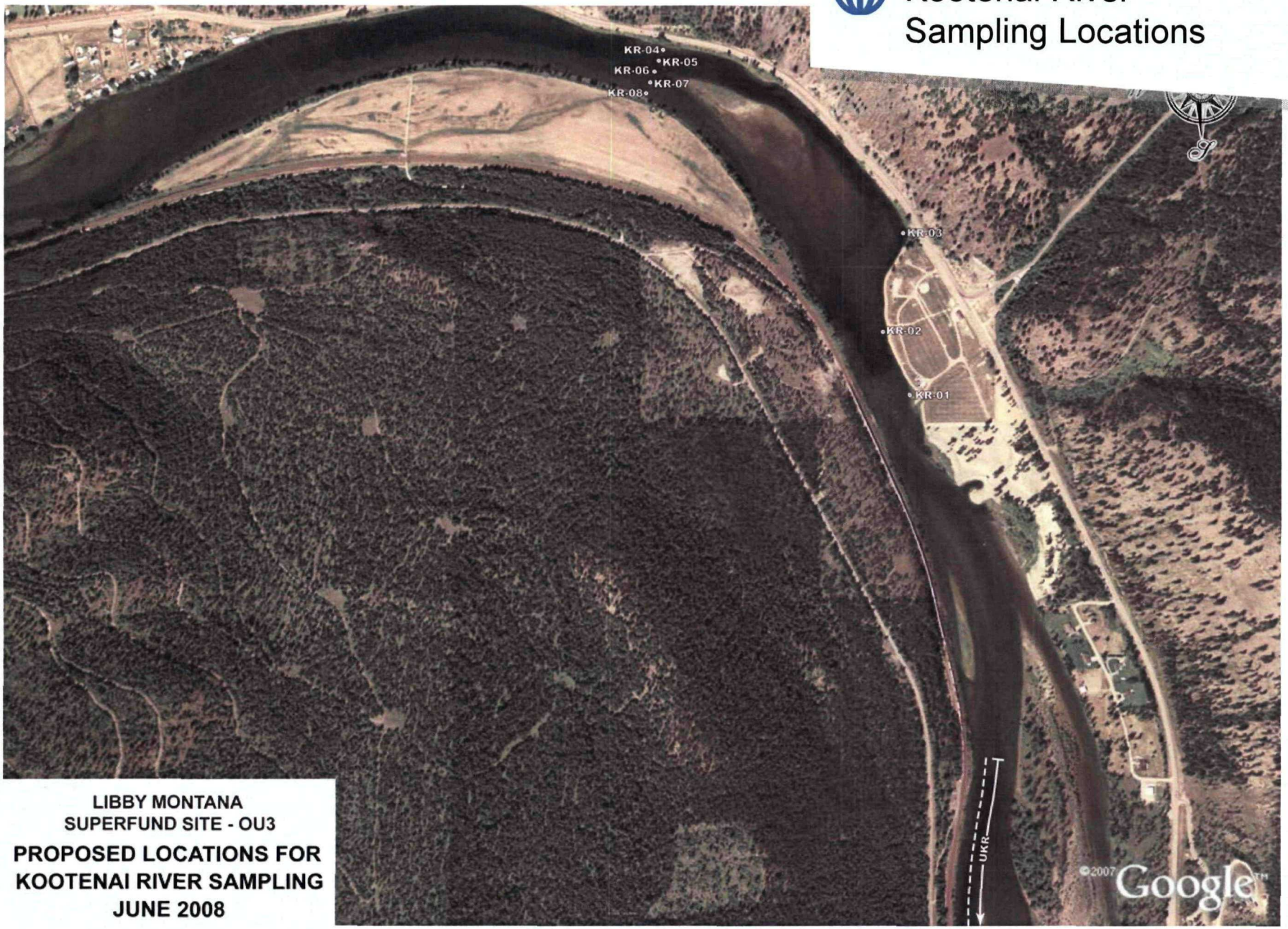
Element 1
Sampling Locations



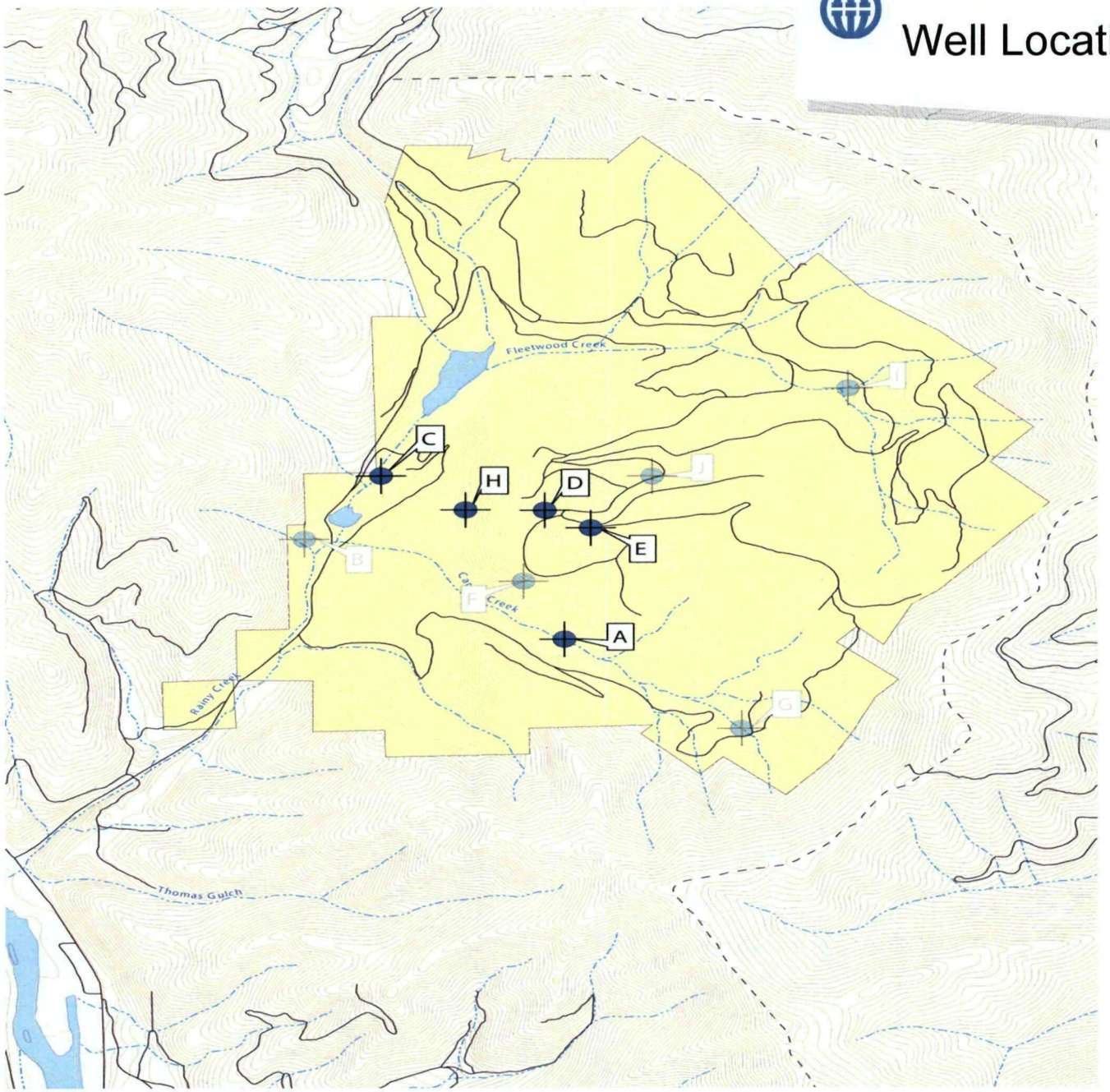
Kootenai River Sampling Locations



LIBBY MONTANA
SUPERFUND SITE - OU3

PROPOSED LOCATIONS FOR KOOTENAI RIVER SAMPLING JUNE 2008

Well Locations



Libby OU3
RI/FS Schedule

- Remedial Investigation - January 2012
- Risk Assessments - February 2012
- Feasibility Study - December 2012
- Record of Decision - July 2013

Ecological Risk Assessment : Working with the BTAG

- EPA Region 8
- Dr. David Charters, EPA ERT
- W.R. Grace
- MDEQ
- Fish and Wildlife Service (Helena Office and ERT)
- Parametrix
- Oregon State University
- SRC, Inc.
- Exponent

OU3 Ecological Risk Assessment and Biological Sampling

Where we started…

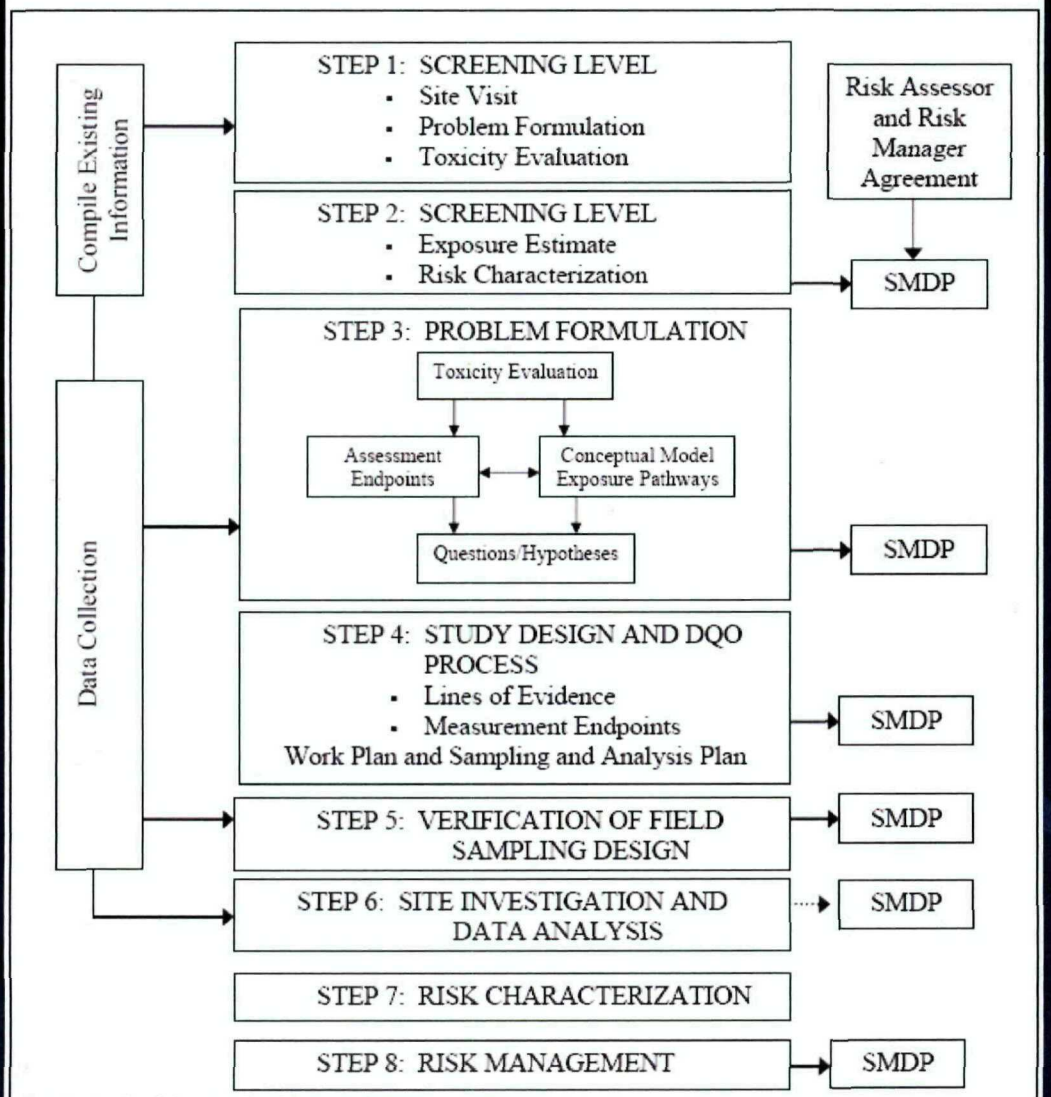
- First Ecological Risk Assessment with asbestos (ever?)
- Sparse exposure and effects information
- Sparse fate and transport information
- Important route(s) of exposure largely unknown
- Sensitive species unknown
- Relevance of LA toxicity to population level effects unknown
  - Latency??
- Typical tools unavailable or need development

Where We Are…

- Process
  - ERA
  - Tools
- Benthic Invertebrates
  - Toxicity test
  - Community survey
- Fish
  - Toxicity test
  - Community survey
- Small Mammals
  - Histology

Figure 1-1. Eight Step Process for Ecological Risk Assessment at Superfund Sites

Baseline Ecological Risk Assessment for Standard Mine Site



Steps 1 & 2 – Tier 1 (Screening-Level Assessment)
Steps 3 to 7 – Tier 2 (Baseline Assessment)

SMDP = Scientific/Management Decision Point

Source: USEPA 1997

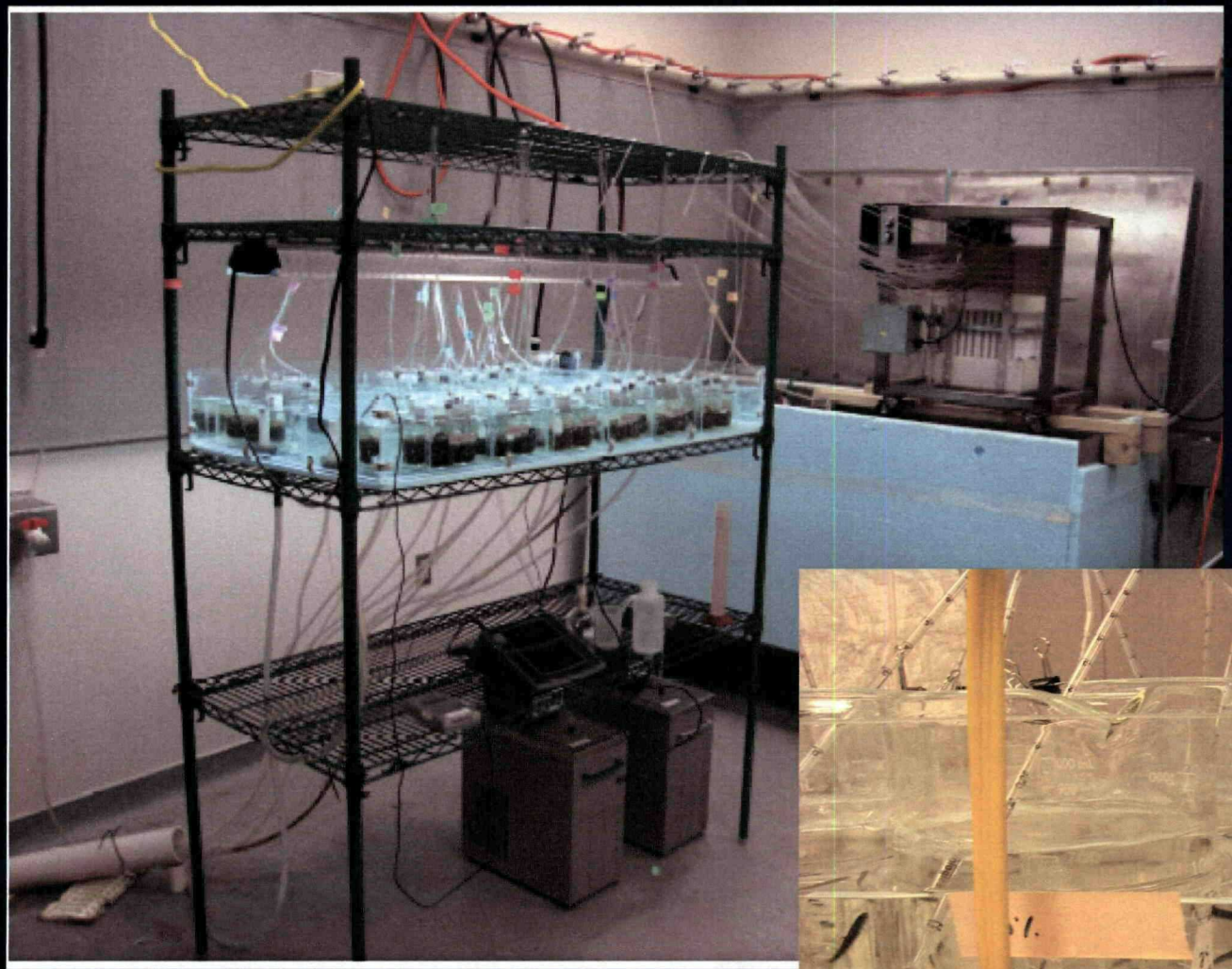
Hazard Quotient

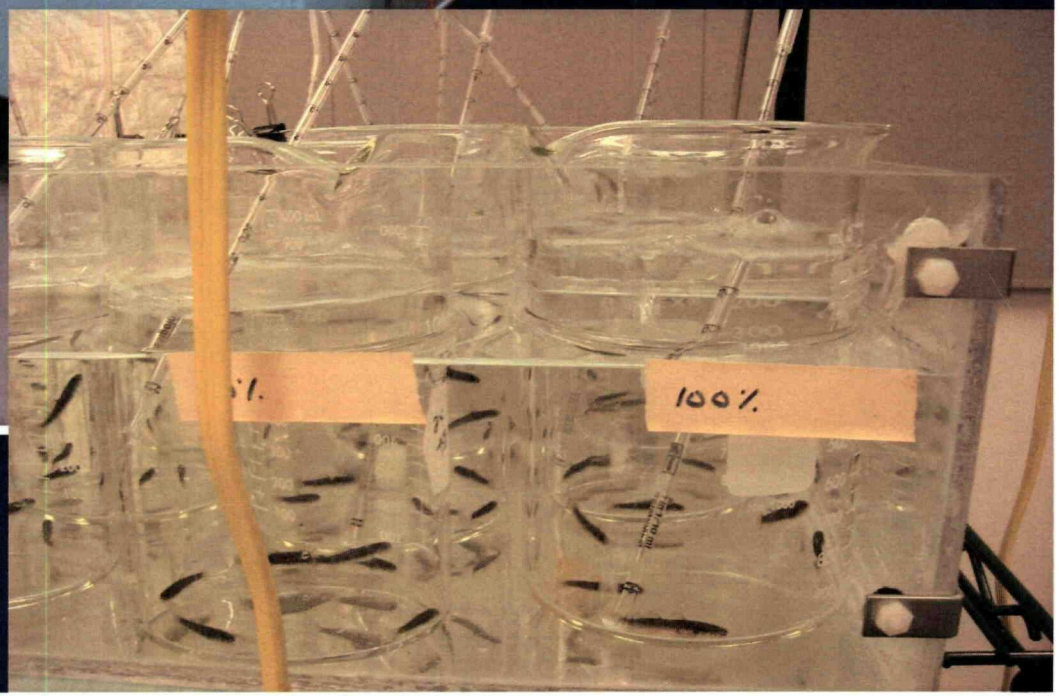
HQ = Exposure / Benchmark or TRV

HQ<1 = Acceptable risk

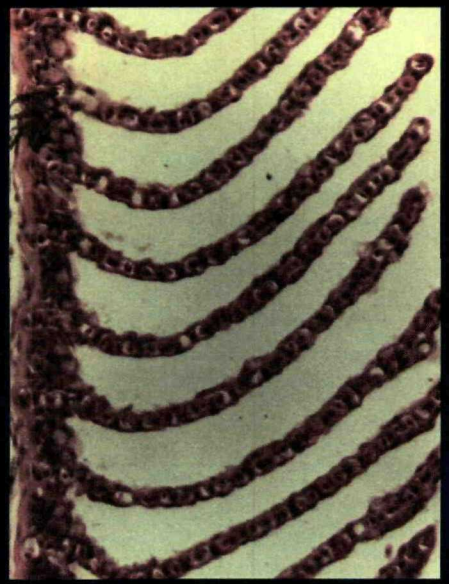
HQ>1 = Further evaluation warranted

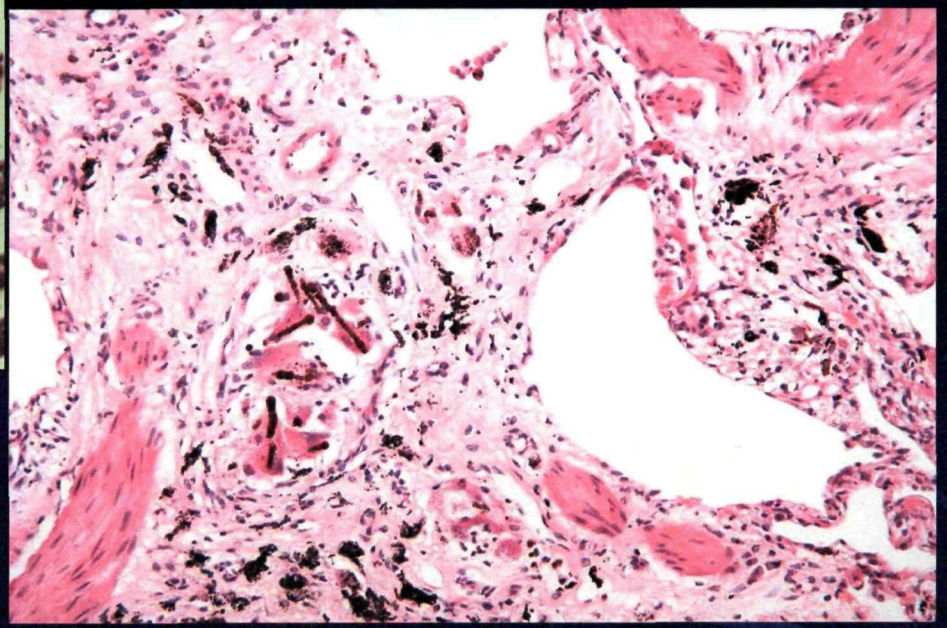
Toxicity Testing





Physical or Biochemical Changes





Community Surveys

Community Surveys-Habitat

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks, and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 9 (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score 107

Weight of Evidence

- Not a formal weighting
- Different lines of evidence support or refute other lines
  - Hazard quotients
  - Toxicity tests
    - Support/refute causality
    - Develop PRG
  - Physical or biochemical changes
    - Support/refute causality
  - Community surveys
    - support/refute toxicity tests
  - Habitat evaluation
    - support/refute community surveys

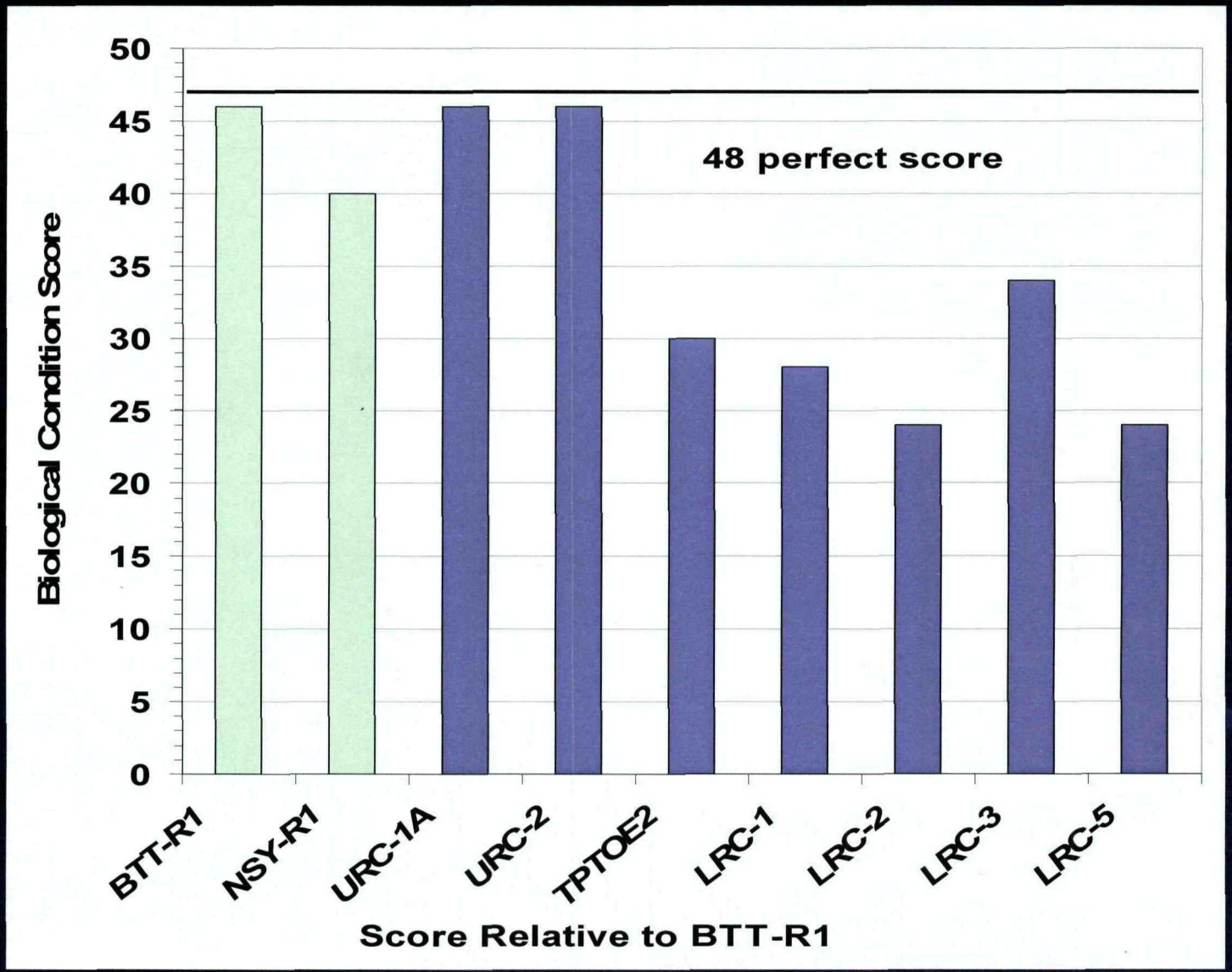
Aquatics – Benthic Invertebrates

- HQ Approach Ø
- Site Specific Toxicity Testing ✓
- Physical or Biochemical Changes Ø
- Community Surveys ✓
  - Habitat Evaluation ✓

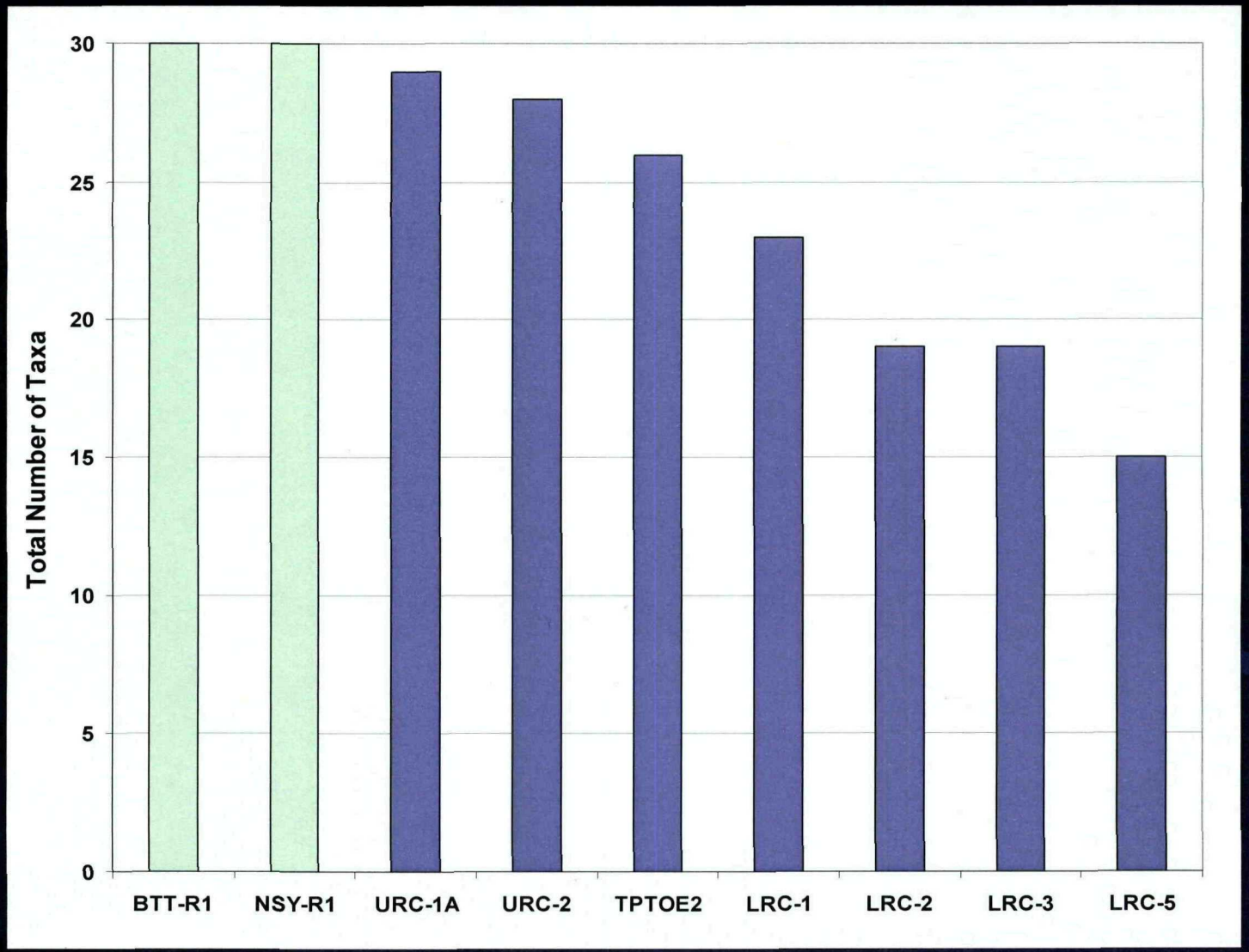
Results: Benthic Invertebrates Toxicity Tests

- Site sediments
  - Concentrations 3% and 5% + 2 Reference
- Standard test organisms and protocols
  - 2 species
  - Life Cycle Tests
  - Growth, Survival, Reproduction
- No adverse effects observed

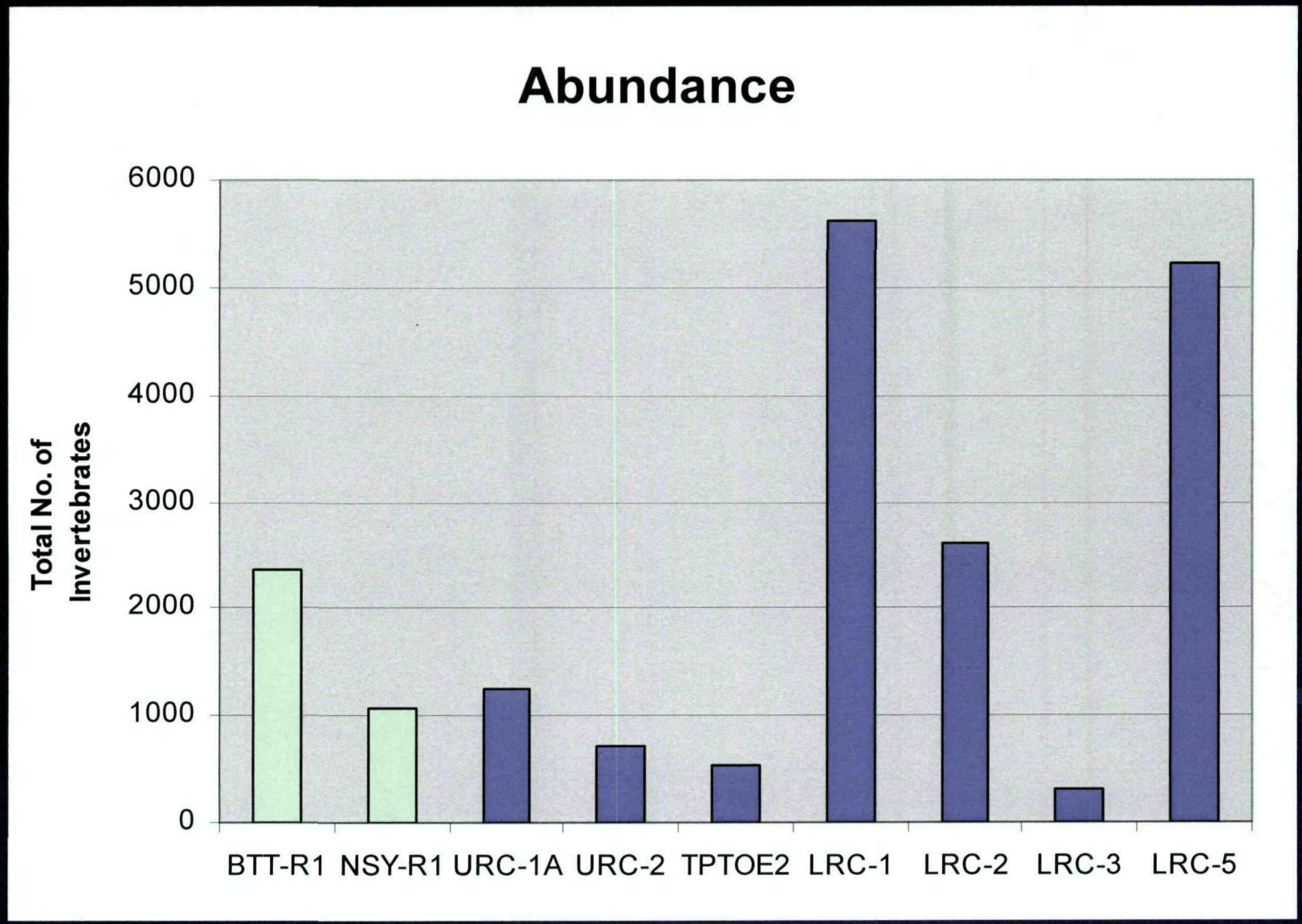
Results: Benthic Invertebrates Community Survey



Results: Benthic Invertebrates Community Survey



Results: Benthic Invertebrates Community Survey



Benthic Summary-to date

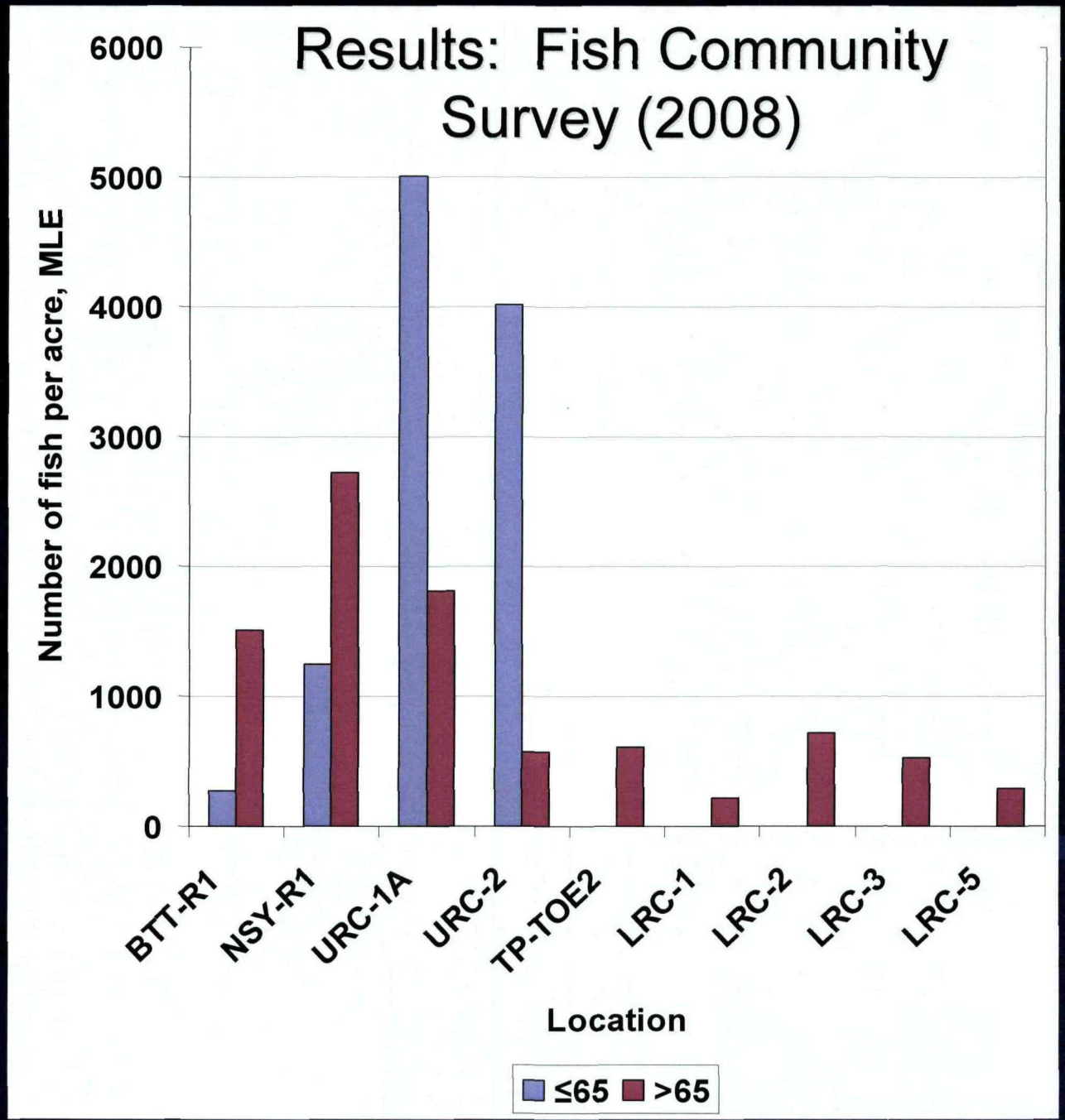
- Lower biological condition score
- Lower diversity
- Similar or higher abundance
- May be due to habitat…waiting for data

Aquatics - Fish

- HQ Approach Ø ✓
- Toxicity Testing ✓
- Physical or Biochemical Changes ✓
- Community Surveys ✓
  - Habitat Evaluation ✓

Results: Fish (Toxicity Test)

- Site water, static renewal, RBT
  - Hatching through swim-up (42 days)
- No mortality or histological changes observed…but
- Unable to maintain exposure concentrations during static-renewal test


Results: Fish Community Survey (2008)
Number of fish per acre, MLE
6000
5000
4000
3000
2000
1000
0
BTT-R1
NSY-R1
URC-1A
URC-2
TP-TOE2
LRC-1
LRC-2
LRC-3
LRC-5
Location
≤65
>65

Moving Forward: Aquatics

- Awaiting Fish and Invertebrate data 2009
- Awaiting quantitative habitat data 2009
- Fiber clumping observed in site water

Fiber Clumping Observed in Site Water

- Re-designing toxicity tests (fish and amphibian)
  - Do we assess the effects of clumping on toxicity?
  - …or do we use total fibers as exposure metric?
- Re-evaluating analytical needs
  - If needed, how do we measure clumps in water?
- Re-evaluating existing site water data
  - *In situ* and *In vivo* clumping

Moving Forward: Aquatics

- Fiber clumping observed in site water (cont.)
  - Do we assess the effects of clumping on toxicity?
  - …or do we use total fibers as exposure metric?
  - How do we measure clumps in water?
  - Are all clumps the same?
  - How much characterization of clumping dynamics in OU3 water is enough?

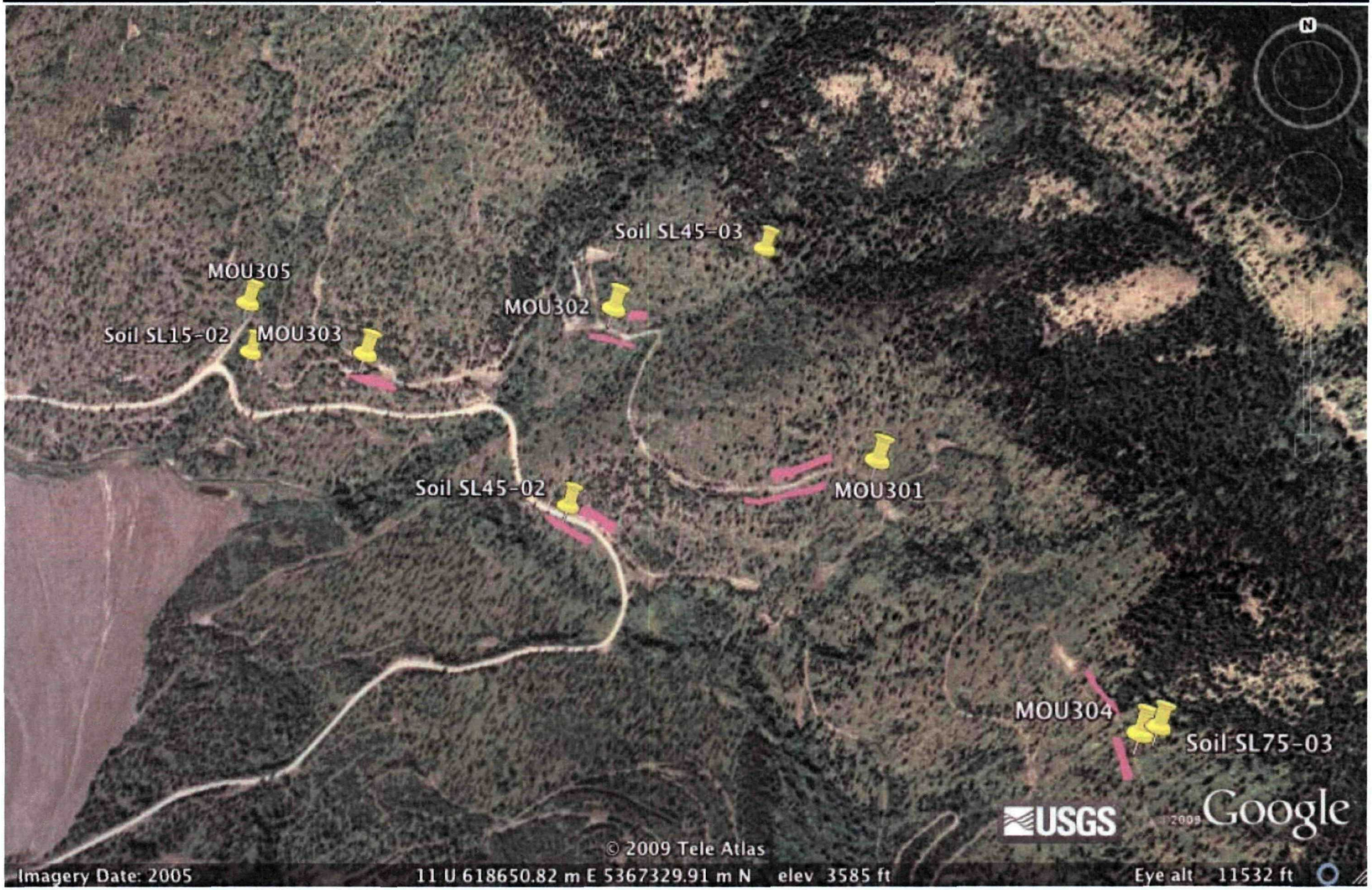
Small Mammals

- HQ Approach Ø
- Site Specific Toxicity Testing Ø
- Physical or Biochemical Changes ✓
- Community Surveys Ø

Design: Small Mammal

- Are any asbestos attributable effects seen in small mammal tissues?
  - Yes ► determine if important to "population"
    - ► more sampling to define extent of effects
  - No ► acceptable risk to small mammals

Design: Small Mammal



Results Small Mammals

- Awaiting pathologist's report

Small Mammals: Moving Forward

- Depending on Results
  - Additional tissues available
    - More histology
    - LA tissue burden
  - Additional Small Mammal Sampling

Where we are going…

- Amphibians
  - Toxicity testing
  - Surveys
- Birds
- Large Mammals…maybe